ABSTRACT

A system and method for improved image reconstruction of the internal properties of a scattering medium is provided. The reconstruction technique employs a model-based iterative image reconstruction scheme. The reconstruction algorithm comprises a forward and inverse model. The forward model of the present method and system is based on the equation of radiative transfer. The forward model predicts the transport of energy through a medium for a given set of internal properties, source positions, source strengths, and boundary conditions, for a medium to be imaged. The inverse model relates the predicted transport of energy to the actual measured energy transport through the medium to determine the actual properties of the medium. The inverse model of the present system and method uses (1) an adjoint differentiation algorithm to determine the gradient of an objective function (normalized error between the predicted and measured values) and (2) minimizes the objective function using a gradient based optimization method. This method and system provides an accurate and efficient scheme for imaging the properties of media having void like regions, high absorbing regions and in general media for which the diffusion approximation is not valid.